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Theoretical and experimental investigations of the formation mechanisms of residual deformations of fibrous layered structure composites

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Abstract

© The Authors, published by EDP Sciences, 2017. On the example of a unidirectional fibrous composite made of unidirectional carbon fibre composite and cold-hardening epoxy XT-118, tests of specimens with a stacking scheme [+45 0 /-45 0]2s, where s is the number of monolayers, were carried out for cyclic loading by tension and compression. When the samples are stretched, both the fibers and the epoxy of composite are under shear stresses and stretching in the transverse direction by normal stresses, and under compression, under shear stresses and compression by normal stresses across the fibers. It is shown that in each loading cycle there is a consolidation of the material associated with the rearrangement of its microstructure, an increase in the secant modulus of elasticity and a decrease in the magnitude of the deformation increment at each cycle. The mechanism of accumulation of residual deformations under multiple loading of test samples was qualitatively studied and their level formed in the composite after each loading cycle was quantitatively found.

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